CLAIMS

What is claimed is:

1. A method for estimating distances to irregularities on a subscriber loop comprising the steps of

measuring a loop response as a function of frequency at a loop end,

weighting the loop response with a pre-selected prolate spheroidal wave function to produce a weighted response, and

generating a spectral analysis of the weighted response wherein the estimated distances to the irregularities correspond to peaks in the spectral analysis.

2. The method as recited in claim 1 wherein the step of generating the spectral analysis of the weighted function includes the steps of

transforming the weighted function via a Fourier Transform to produce a transformed function, and

identifying the peaks in the transformed function to obtain the estimated distances.

3. The method as recited in claim 1 wherein the step of generating the spectral analysis of the weighted function includes the steps of

transforming the weighted function via a Fast Fourier Transform to produce a transformed function, and

identifying the peaks in the transformed function to obtain the estimated distances.

4. The method as recited in claim 1 wherein the loop response is the real part of the return loss of the loop with respect to a reference impedance and the step of measuring includes the step of measuring a swept-frequency signal proportional to the real part of the return loss.

5. The method as recited in claim 1 wherein the loop response is composed of exponentially decaying co-sinusoids and the step of measuring includes the step of measuring a swept-frequency signal proportional to the loop response.

6. A method for estimating distances to irregularities on a subscriber loop comprising the steps of

measuring the real part of the return loss of the loop using a pre-selected reference impedance over a band of frequencies to generate a loop response,

weighting the loop response with a spectral window to generate a weighted loop response,

iteratively multiplying the weighted loop response with a pre-determined multiplier function to produce a characteristic function,

transforming each iteratively produced characteristic function to determine a set of corresponding characteristic values, and

selecting local maxima from the set of characteristic values as estimates to the distances to the irregularities.

7. The method as recited in claim 6 wherein the step of weighting includes the step of multiplying the loop response by a pre-selected prolate spheroidal wave function to produce the weighted response.

8. The method as recited in claim 6 wherein the step of transforming includes the step of Fourier Transforming the weighted loop response.

9. The method as recited in claim 6 wherein the step of transforming includes the step of Fast Fourier Transforming the weighted loop response.

10. The method as recited in claim 6 wherein the multiplier function is a co-sinusoidal function and the step of iteratively multiplying includes the step of incrementally selecting a new period for the co-sinusoidal function with reference to the length of the loop.

11. The method as recited in claim 6 wherein the multiplier function is a co-sinusoidal function and the step of iteratively multiplying includes the step of incrementally selecting a new period for the co-sinusoidal function with reference to intermediate distances along the loop.

12. The method as recited in claim 6 further including the steps, after the step of selecting, of

hypothesizing a set of loops having irregularities commensurate with the estimated distances to the irregularities, and

selecting one of the loops from the set by comparing the measured loop response to a corresponding loop response from the selected one of the loops.

13. A method for determining a configuration for a subscriber loop comprising the steps of

measuring a loop response as a function of frequency at a loop end,

weighting the loop response with a weight function to produce a weighted response,

generating a spectral analysis of the weighted response wherein the estimated distances to the irregularities correspond to peaks in the spectral analysis,

hypothesizing a set of loops having irregularities commensurate with the estimated distances to the irregularities, and

selecting one of the loops from the set by comparing the measured loop response to a corresponding loop response from the selected one of the loops.

14. The method as recited in claim 13 wherein the step of weighting includes the step of weighting the loop response with a prolate spheroidal wave function waveform.

15. A method for determining the configuration of a subscriber loop comprising the steps of

measuring the real part of the return loss of the loop using a pre-selected reference impedance over a band of frequencies to generate a loop response,

weighting the loop response with a spectral window to generate a weighted loop response,

iteratively multiplying the weighted loop response with a pre-determined multiplier function to produce a characteristic function,

transforming each iteratively produced characteristic function to determine a set of corresponding characteristic values,

hypothesizing a set of loops wherein each of the loops in the set has a set of characteristic values commensurate with the set of characteristic values of the measured loop, and

selecting one of the loops from the set of loops based upon a comparison of each set of characteristic values of each of the loops to the set of characteristic values of the measured loop.

16. The method as recited in claim 15 wherein the step of weighting includes the step of multiplying the loop response by a pre-selected prolate spheroidal wave function to produce the weighted response.

17. The method as recited in claim 15 wherein the step of transforming includes the step of Fourier Transforming the weighted loop response.

18. The method as recited in claim 15 wherein the step of transforming includes the step of Fast Fourier Transforming the weighted loop response.

19. The method as recited in claim 15 wherein the multiplier function is a co-sinusoidal function and the step of iteratively multiplying includes the step of incrementally selecting a new period for the co-sinusoidal function with reference to the length of the loop.

20. The method as recited in claim 15 wherein the multiplier function is a co-sinusoidal function and the step of iteratively multiplying includes the step of incrementally selecting a new period for the co-sinusoidal function with reference to intermediate distances along the loop.